Towards a Hybrid Account of Luck

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TOWARDS A HYBRID ACCOUNT OF LUCK

BY

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Abstract: The concept of luck is important in various areas of philosophy. In this paper, I argue that two prominent accounts of luck, the modal and the probabilistic account of luck, need to be combined to accommodate the various ways in which luck comes in degrees. I briefly sketch such a hybrid account of luck, distinguish it from two similar accounts recently proposed, and consider some objections.

1. Introduction

Luck is a slippery notion. Yet the concept clarifies central notions in ethics and epistemology.[1] Two rival accounts of luck are the modal account (Pritchard, 2005, 2014) and the probabilistic account (Rescher, 2001, 2014).[2] I argue that these should not be seen as rivals: a plausible account of luck includes both probabilistic and modal conditions. I sketch the contours of such a hybrid account of luck, distinguish it from similar accounts, and consider some objections.[3]

One caveat before we begin. I am not committed to the completeness of the hybrid account developed in this paper. My main claim is that probabilistic as well as modal conditions are necessary for an adequate account of luck, not that they are sufficient.[4] In principle, the account developed is compatible with additional conditions on luck.

2. The modal account of luck

According to proponents of the modal account of luck, lucky events are distinguished by their modal profile. Duncan Pritchard captures the idea in the following way:

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(L1) If an event is lucky, then it is an event that occurs in the actual world but which does not occur in a wide class of the nearest possible worlds where the relevant initial conditions for that event are the same as in the actual world. (Pritchard, 2005, p. 128)

A lucky event is thus an event that could have easily failed to occur in the sense that it fails to occur in a wide class of nearby worlds.[5] Modal distance is determined exclusively by similarity between worlds, so a lucky event is an event that fails to occur in worlds similar to the actual world.[6] Only those worlds where the initial conditions for the event are the same as in the actual world are relevant. These 'relevant initial conditions' are to be determined on a case-by-case basis (Pritchard, 2005, p. 132). I will leave this last clause implicit in most of the following discussion.

Proponents of the modal account of luck sometimes include other conditions in their analysis of luck besides (L1).[7] In what follows, I will set these aside. As noted, the account developed in this paper will be compatible with such additional conditions.

Luck is a graded concept: events can be lucky to a greater or lesser extent. Pritchard accommodates this fact about luck in the following way:

[D]egree of luck involved varies in line with the modal closeness of the world in which the target event does not obtain (but where the initial conditions for that event are kept fixed). (Pritchard, 2014)

The idea is thus that the less change is needed for the event to fail to obtain, the higher the degree of luck. For example, I am luckier to survive when a sniper's shot misses me by an inch, than when it misses me by a mile. Plausibly, this is because in the second case, the nearest world where I get shot is less similar to the actual world than in the first case.

The foregoing means that not only *nearby* possibilities are relevant for whether an event is a case of luck or not. The degree to which events are subject to luck can vary between 1 (where the event fails to occur in the nearest possible worlds where the relevant initial conditions are the same as in the actual world) and 0 (where the event does not fail to obtain in *any* such possible worlds). An event may be subject to a minute degree of luck because it only fails to obtain in a world far removed from the actual one.[8]

The idea that degree of luck depends exclusively on modal distance is mistaken, however. There are large classes of cases that bring this out. As an example, consider the following:

C1: Jaimy wins the lottery. Her ticket is randomly selected out of the 10 000 000 tickets that have been sold for this lottery.

C2: Jerome wins the lottery. His ticket is randomly selected out of the 100 tickets that have been sold for this lottery.

Let us stipulate that in both of the above cases, the procedure for selecting the lottery results is the same, say by numbering each ticket and then using a random number generator to select a number out of the relevant range. Further, we will stipulate that in both cases, the nearest worlds where these events fail to obtain are worlds where the number generator picks out just one different digit. Under these assumptions, the modal distance between the nearest world where Jaimy loses and *her* actual world is equal to the modal distance between the world where Jeremy loses and *his* actual world. In both cases, just one digit needs to randomly change for the winning ticket to become a loser. The point is that if modal distance were the only determinant of luck, these events should be equally lucky.

But this clashes considerably with our intuitions. It seems clear that Jaimy is *more* lucky to win than Jerome. The intuition can be strengthened by making the difference more extreme, by letting the number of tickets sold in Jaimy's case be 10^{10} and in Jerome's case be just 2.

The proponent of the modal account of luck might try to argue that the relevant modal distances in these case do in fact differ. But this will be very hard given the stipulation that the relevant mechanism for selecting a ticket is the same in both cases. Only the pool of available numbers is larger in the first case, but this is irrelevant. In both cases, the final digit might have just as easily be, say, a 5 instead of a 4, turning a winning ticket into a loser.

While the difference in degree of luck cannot be explained in terms of modal distances, we *can* explain the difference in terms of probability. For in the above cases, the probability that Jaimy will win the lottery is clearly lower than the probability that Jerome will win.[9] An inverse relation between luck and probability does explain why Jaimy is more lucky to win than Jerome. That there is such a relation between luck and probability is the guiding thought behind the account of luck to which we turn in the next section.

3. *The probability account of luck*

On a modal account of luck, lucky events are events that could have easily failed to occur in the sense that these events fail to occur in worlds similar to the actual world. But there are other possible interpretations of the notion of 'easy possibility'.

For proponents of the probability account of luck, events that could have easily failed to obtain are events that have high probability of not obtaining, or, what amounts to the same thing, a low probability of obtaining.

This account can be supported to a large extent by the same cases that support the modal interpretation. For just as winning the lottery is an event that fails to occur in worlds much like our own, this event also has a low probability of occurring.[10]

A probabilistic interpretation of easy possibilities is not just plausible in the context of the analysis of luck. When we say things like 'It is not easily possible to beat the house in roulette', or 'It is easily possible that our soccer team advances to the next round', these statements seem to at least partially track our probabilistic judgements. In the above cases, we think it is not very probable to beat the house in roulette, but we think it is highly probable that our favourite soccer team advances to the next round.[11]

Such a probabilistic approach is championed recently by Nicholas Rescher (2001, 2014). On Rescher's account, (good) luck (λ) is a product of the significance of an event (Δ) and the probability that the event did *not* occur ($1 - p$):

$\lambda = \Delta - \Delta(p)$ (Rescher, 2014, p. 624)[12]

For Rescher, the degree of luck to which an event is subject is inversely related to the probability of the event occurring. In general, higher probability (holding fixed significance) means less luck.[13]

Modal and probabilistic interpretations of easy possibilities are not equivalent (Pritchard, 2005; Smith, 2016; Williamson, 2009). Suppose in C1 above that Jaimy loses instead of wins. Given the number of tickets sold, this is extremely likely. Crucially, however, the nearest world where Jaimy wins instead of loses is still *modally* very close. Just a few different numbers would have to be selected. So losing is easily possible on the modal account but not on the probabilistic account.

C1 and C2 motivate a probability condition on luck. Perhaps all differences in degree of luck can be captured in probabilistic terms. Unfortunately, this seems not to be the case:

C3: The company where Jill works is downsizing. To determine which one of Jill's co-workers, gets fired, the CEO decides to assign a number to each of his 1000 employees, and then to use a random number generator to decide which single person has to go. Jill's number does not come up and she is not fired.

C4: Joe has an important meeting today. If he forgets his documents, he will be fired. Because of this, Joe has put in place extensive safeguards. For example, he put the documents in his briefcase the night before, put a reminder in his calendar, asked his spouse to remind him about the documents before he would leave for work, and sent the documents to his secretary so that he could print it should he still have forgotten it. Still, there is a small chance, $p = 0.001$, that all safeguards fail and that Joe will consequently be fired. As it turns out, they do not all fail, and Joe is not fired.

In the examples, both Jill and Joe kept their jobs. But I submit this was more a case of luck in Jill's case than it was in Joe's. The difference cannot be explained in probabilistic terms, because the relevant probabilities are equal: both Jill and Joe had a probability of 0.001 of being fired. Instead, what drives our verdict seems to be the fact that Jill could have much more *easily* lost her job than Joe. For Jill to lose her job, a few different selected digits will suffice; for Joe to lose his job, a wide range of safeguards would all have to fail all at the same time. Jill's world needs to be altered to a lesser extent to accommodate the former event than Joe's world to accommodate the latter.[14]

For additional support, we will look at another pair of cases.

C5: Even though it is extremely unlikely, there is some positive probability to the event of the King coming by my house tomorrow to give me a €1000,-. Let us say the probability for the event is $1*10^{-7}$. As expected, this does not happen.

C6: I have been given a ticket in a fair lottery, where a random number generator selects the winning ticket, which earns €1000,-. The probability of my ticket winning is $1*10^{-7}$. As expected, I do not win.

I submit that there is more bad luck in C6 than in C5. By stipulation, the probabilities are equal. Still, lottery losers are commonly consoled with the words 'Tough luck!' or 'Better luck next time!', whereas no reasonable person would think it a matter of bad luck that I did not receive €1000,- from the King today. Again, the difference can be explained in modal terms: less needs to change to the actual world for me to receive €1000,- in the second case (just a few different numbers would have to be generated) than in the first case (where this requires at a minimum extensive modifications of the King's current preoccupations and schedule, as well as the invention of a motive for the King to give me €1000,-).

The foregoing suggests a recipe: take an extremely unlikely event, an event that requires extensive modification to the current situation to occur, and then contrast this event with a lottery where the same positive or negative effect occurs, and with the same probability, but on the basis of a random number selection. Failings of the former kind of event to occur will generally be less lucky than failings of the second kind. Because the cases are constructed such that the only difference is the modal distance between the nearest world where the event fails to obtain and the actual world, the only factor able to explain this difference in luck is modal distance. This indicates that not all differences in degree of luck can be explained in terms of differences in probability. To accommodate some differences, we need a factor for modal distance in our account of luck.

This last claim is given further support in the empirical work of Karl Teigen (1996, 2005). Teigen's studies indicate that not just probabilities but also modal distance influences people's ascriptions of luck. For example, Teigen found that certain judgements of luck do not depend on probability but rather on counterfactual closeness of alternatives: subjects were found to judge events as dissimilar in the amount of luck that was involved, even while explicitly admitting that the probability for the events was the same (Teigen, 2005). Teigen's examples included judgements of luck concerning roulette wheel outcomes. If the outcome was physically close to the number on which subjects had placed bets, the subjects judged the event to be a case of (bad) luck. The further the outcome was physically removed from this number, the less willing subjects were to regard the event as a case of luck, even if they agreed that the probabilities of the relevant events were the same, providing support for the claim that sometimes, our judgements of luck are responsive to modal distance *rather* than to probability.[15]

At this point, the defender of a purely probabilistic account of luck might object that we are considering the wrong probabilities here. In C3 and C4, *initially* Jill and Joe have the same probability of being fired, but *after* the day has progressed a bit, these probabilities will have changed.[16] Perhaps these latter probabilities help to explain the difference in luck between Jill and Joe. The objection gets the problem the wrong way, however. We consider the events just as they are specified. On *this* specification, there is a difference in luck, even though, thus specified, the probabilities are the same. The difference can only be explained in terms of modal distance. It does not help to say that under a *different* specification the odds are different, for under a different specification, relevant modal distance will also change. For example, if we specify the relevant initial conditions for Jill being fired such that they include that her ticket was drawn, then there are *no* close possible worlds where she is not fired, and so the modal account of luck would not classify the case as a case of luck at all. Moreover, the relevant question is not whether there are differences in degree of luck that can be explained by a pure probabilistic account, but whether there are differences that cannot.

The discussion so far indicates that neither a purely modal account nor a pure probabilistic account of luck can accommodate all differences in degree of luck. This motivates an investigation into the prospects for a *hybrid* account of luck, which we will undertake in the remainder of the paper.

4. *A hybrid account*

In the previous sections, we saw that neither a purely modal nor a purely probabilistic account of luck can accommodate all considered differences in degree of luck. In this section, I suggest a novel, hybrid account of luck that can.[17]

To start, let us state our findings so far:

LUCK-1: Degree of luck (partially) depends on probability. Other things equal, the lower the probability for the event, the higher the degree of luck.

LUCK-2: Degree of luck (partially) depends on modal distance. Other things equal, the closer the nearest world where the even fails to obtain is to the actual world, the higher the degree of luck.

By themselves, these claims are not new. We saw that LUCK-1 stands at the basis of the probabilistic account of luck, and LUCK-2 at the basis of modal accounts of luck. The novelty of the present paper is that it argues for *both* LUCK-1 and LUCK-2.

Once one claims, as I do, that degree of luck depends on two factors instead of one, the question arises how to *weigh* these factors against each other. In what follows I will propose an answer to this question.

In order to get started, I will assume that the degree of similarity between two worlds can be represented on a scale ranging from 0 to 1. This is a substantial assumption, but it seems reasonable, given that we can make sense of the idea that two worlds are close to identical (which will be represented as a degree of similarity close to 1), as well as of the idea of two worlds being almost completely dissimilar (sharing few, if any, properties, represented by a degree of similarity close to 0).[18] It also seems relatively clear that the similarity between most worlds will lie somewhere in between these cases.[19] Once this metric is adopted, the modal distance between the actual world and the nearest world where the relevant event does not occur is interpreted straightforwardly as $1/S$, the similarity between these worlds. The higher the value of S, the more similar the worlds are to each other, the smaller the modal distance is between them, and the higher the degree of luck, *ceteris paribus*, to which the event is subject.

Is there any reason for weighing the influence of modal distance on luck differently from the influence of probability? I do not see one. The cases discussed above indicate only that both factors have *some* influence, not how much each factor has. I think, therefore, that it is best to remain as uncommitted as possible here and to weigh these factors equally until further evidence to the contrary arrives. In the absence of such evidence, this seems like the reasonable thing to do.

There are multiple possible ways of weighing both factors equally. I will consider two natural ones. First, by averaging

$$\lambda_{+} = (S + (1 - p))/2^{20}$$

Second, by multiplication

$$\lambda_* = S - S(p)$$

Both λ_+ and λ_* range over [0,1] and represent the degree of luck to which an event is subject. Both λ_+ and λ_* respect LUCK-1 and LUCK-2. For both, it holds that other things equal, the higher the probability of an event, the lower the degree of luck. For both, it holds that other things equal, the smaller the modal distance between the nearest world where the event fails to obtain and the actual world, the higher the degree of luck. Both thus respect the findings from the previous sections. Both also respect the highly plausible claim that necessary events ($S = 0$, $p = 1$) are not lucky at all.[21] In both instances, probability and modal distance are given equal weight. Both alternatives are thus *prima facie* acceptable candidates for a hybrid account of luck. Still, there are some reasons for preferring λ_+ to λ_*.

To see this, let us consider some examples. First, consider the event of winning the lottery. Let us assume that I am one of a hundred ticket holders, all equally likely to be selected as winner ($p = 0.01$). Let us further assume that the winning numbers are being generated by a mechanism that makes it such that for any selected number, very little would need to change for another number to be selected ($S = 0.99$). Putting in these numbers, $\lambda_+ = 0.99$ and $\lambda_* = 0.98$. Here, the difference in verdict is very small between λ_+ and λ_*. Both measures (correctly) classify the event as very lucky. Now contrast this case with the case of *losing* the same lottery. Of course, the probability for this event is the inverse of the probability of winning the lottery ($p = 0.99$). Note, however, that due to the fact that the winning number is generated in the same way as before, S will be equal between the cases. If you have ticket #3, not much would have to change for the mechanism to select your number instead of one of the others, and so there are some (very) close possible worlds where it does ($S = 0.99$). Inputting *these* numbers, $\lambda_+ = 0.5$ and $\lambda_* = 0.0099$. Now, matters look very different. On both accounts, you are more lucky to win the lottery than to lose, which is at it should be. But λ_+ classifies the event of losing the lottery as still moderately lucky, whereas λ_* classifies the event as subject only to an almost negligible amount of luck.

Although perhaps not immediately apparent, this is a reason to prefer λ_+ over λ_*. Why? Because lottery losses *are* cases of moderate (bad) luck. As noted above, natural language use indicates this because one often finds lottery losers consoling themselves with phrases like 'Better luck next time!', 'Bad luck!', 'Just my luck!', and so forth. While one should not exclusively rely on such locutions, they do indicate that people feel that losing the lottery and bad luck are strongly related. Second, interpreting lottery cases in this way allows us to make sense of a well-known puzzle in epistemology. As is nearly universally agreed, we do not know that we have lost the lottery before the results are announced, even if the belief is true and we base it on

the extremely high probability this belief has of being true. One explanation available to the proponent of λ_+ as a measure of luck is that in such cases, it would be a matter of substantial luck if our method produced a true belief.[22] Even if the probability of losing is high, you are still subject to a substantial amount of bad luck if it happens, and therefore, your belief-forming method only luckily produces true belief. Because it is widely accepted that knowledge is incompatible with this kind of luck, we can explain *why* we do not know lottery propositions even despite the massive (probabilistic) evidence we may have in their favour. Note that this explanation is unavailable to the proponent of λ_* as a measure of luck, because for increasing sizes of lotteries, λ_* will converge to 0.

Our proposal is able to accommodate the differences in luck between the pairs of cases presented above. Jill is more lucky than Joe, because S for her is higher than for Joe, which, given the same probabilities, will result in a higher degree of luck. We can explain the difference between Jaimy and Jerome by appealing to the fact that for Jaimy (p) is much lower than for Jerome. Both our pairs of cases can thus be straightforwardly accommodated by our hybrid account.

Because λ_+ thus not only captures the features of luck identified in this paper but also coheres well with the way we speak about luck and, as a bonus, can be used to solve epistemological puzzles, I will take it to be a *prima facie* plausible measure of degree of luck. More tweaking may be necessary, but for a proof of principle, it seems reasonable enough.

I have provided pairs of cases that pose problems for traditional analyses of luck. Are there any analogous cases that pose problems for our account? That is hard to say without committing to any specific set of jointly *sufficient* conditions for luck. If one finds a difference of degree of luck that cannot be explained by referring to a difference in probability or modal distance, then that is reason to suppose these conditions are not sufficient either, but again, I do not claim they are.

It is for the same reason that well-known counterexamples to purely probabilistic or modal accounts of luck fail to gain traction on our account (Hales, 2016; Lackey, 2008). Lackey's counterexample involves a case where separately modally robust conditions fortuitously combine with the discovery of a treasure as a result. Lackey claims the discovery is a clear case of luck, even though the event will not fail to occur in nearby worlds where these conditions are met. This is problematic for purely modal accounts of luck, who have no other resources to explain the luckiness of an event than the modal distance between the actual world and the nearest possible worlds where the event fails to occur. But our account is a hybrid one and can additionally refer to low probabilities to explain the luckiness of the event. And in Lackey's case, the discovery of the treasure has a low initial probability.[23] Hales, on the other hand, present cases of lucky necessities to argue that both probability and modal accounts fail, because necessary events

are maximally probable and do not fail to occur in any possible worlds. However, as we said above, our claim is the modest claim that both probability and modal distance are important drivers of luck, not the more ambitious claim that they are the *only* drivers of luck. Hales' cases are counterexamples to the latter, but not the former claim.[24]

Thus, while an account of luck in terms of modal distance or probabilities *alone* would be problematic, an account of luck that accommodates the influence of both these factors seems much more compelling. In this section, I have suggested a specific formulation of such an account. In the next section, I will compare the account to similar accounts proposed by Carter and Peterson (2017) and Wilhelm (2018) and argue that our account has some advantages.

5. *Two similar accounts of luck*

What I have said about luck is importantly similar to the points made in two recent papers discussing the conditions on luck (Carter & Peterson, 2017; Wilhelm, 2018). Both of these papers provide additional support for the claim that luck does not depend on modal distance alone. In this section, I will compare the present account to these two distinct accounts and argue that the one proposed in the present paper is preferable.

First of all, let us briefly review the account of luck developed by Carter and Peterson. Carter and Peterson provide the following definition of degree of luck, to which they refer with the term *modal weighted likelihood* of an event E ($ml(E)$):

$$ml(E) = \int_{x=0}^{\infty} w(x) \cdot (1 - d(E, x))$$

First, $w(x)$ is a value between 0 and 1 that denotes the weight assigned to events that occur at distance x from the actual world. This weight is inversely related to the modal distance x; the smaller x is, the higher $w(x)$ will be. As Carter and Peterson note, '[i]t is plausible to assume that $w(x)$ approaches 0 as x approaches ∞ and that $w(x)$ approaches 1 as x approaches 0' (2017, p. 2181). This has the consequence that just like for our account, *ceteris paribus*, the greater the modal distance between the nearest world where an event fails to occur and the actual world (higher x), the lower the degree of luck to which it is subject.

Second, $d(E,x)$ denotes the density of E worlds at distance x from the actual world. In the words of Carter and Peterson, '[f]or each distance x from the actual world, $d(E, x)$ assigns a value [0,1] that represents the density of E-worlds at distance x from the actual world, such that $d(E, x) = 0$ if and only if

E occurs in no world at distance x, and $d(E, x) = 1$ if and only if E occurs in all worlds at distance x'.

Crucially, for Carter and Peterson, degree of luck is determined not by modal distance alone but *also* by the density of worlds where the relevant event fails to obtain at any particular modal distance. Their account is similar to ours in that it acknowledges that luck depends on modal distance but argues that modal distance is not the only factor of influence. Contrary to the present account, however, Carter and Peterson identify the missing factor as a member of a set of specific density functions defined over modal space, and without further specification, it is not clear whether probability functions belong to this set.[25]

In any case, Carter and Peterson's specific definition of luck is problematic for reasons identified in a recent paper by Isaac Wilhelm (2018). First, Wilhelm argues that 'for many contextually appropriate $w(x)$ and many plausible $d(E, x)$, the integral used to define $ml(E)$ does not exist' (2018, p. 17). As an example, take $d(E,x) = \frac{1}{2}$ and $w(x) = f(x)$, where $f(x) = \frac{1}{x}$ for $x \geq 1$ and $f(x) = 1$ for $0 \leq x < 1$. For this combination of $d(E,x)$ and $w(x)$, $ml(E)$ is undefined. This is problematic, because it seems that degree of luck should be determinable if an event occurs in exactly half of the possible worlds at each distance x.

The second worry raised by Wilhelm is that Carter and Peterson do not define their notion of density, instead relying on an intuitive understanding to serve their purposes. However, for a 'formal definition and discussion', they refer to a number-theoretic concept of density (Carter & Peterson, 2017, p. 2181). This is problematic due to the fact that modal space is often assumed not be countable. Such a number-theoretic notion of density will thus be of no help.

These technical difficulties make Carter and Peterson's analysis ultimately unsatisfactory. As Wilhelm argues, probability functions do not face these problems and are therefore preferable. Unfortunately, Wilhelm throws the baby out with the bathwater by formulating a *pure* probability account of luck. This account is problematic for the reasons presented in the previous parts of this paper: probabilities do not seem to be the only drivers of luck. Our hybrid account has the advantage of accommodating both the probability of an event *and* the influence of the modal distance of the nearest non-occurrence on degree of luck and is superior in this respect to both the accounts of Carter and Peterson and to the account of Wilhelm.

6. *Objections*

Our account stresses the relevance of both probability and world similarity for luck. There are several worries, however, that either have already been

raised in the literature or that may yet be raised against such accounts of luck. In this section, I will consider what I take to be the most important of these.

First, one may object to our hybrid account on the grounds that current modal accounts of luck already have the resources to explain the relevance of probabilities and thus that it is superfluous.[26] Such an objection may draw on passages like the following:

> … as the width of worlds in which the event in question does not obtain recedes then our intuition that luck is involved recedes with it. (Pritchard, 2005, pp. 129–130)

> … The larger the proportion of nearby worlds in which the event did not occur, the chancier its occurrence in the actual world, and—other things equal—the luckier its occurrence. (Levy, 2011, p. 16)

These statements should not be understood in probabilistic terms, however. First, Pritchard is quite clear that we should not think luck depends on probability:

> Our judgements about knowledge [and luck] are thus sensitive to the modal closeness of error, as opposed to its probabilistic closeness. (Pritchard, 2014)

Quotes like this, together with the fact that in his most recent writings on the topic, all reference to the 'width of worlds' where the event fails to obtain have been lost (Pritchard, 2014), make it clear that Pritchard does not think we should understand luck even partly in terms of probability. As should be clear by now, I think this is a mistake.

Levy's account, on the other hand, should also not be understood in probabilistic terms. For probabilities are usually determined by the partitioning of the *whole* of logical space, including both nearby and far-off possibilities, which means that Levy's account, which refers only to proportions of nearby possibilities differs substantially from ours. So neither Pritchard nor Levy captures the influence of probability on luck.

A final objection to our account may be that it is ad hoc. The main reason for endorsing our hybrid account of luck is that it is able to accommodate certain cases. Preferably, we would like an explanation as to why it is the case that both probability and modal distance are relevant for luck, a reason based on principled grounds rather than on the desire to save as much of our intuitions as possible.

One such explanation can be provided by going back to the claim made at the beginning of this paper that lucky events are events that could have easily failed to occur. As we suggested above, this claim may be ambiguous. It can either mean that the event in question has a low probability or that it fails to

occur in a world much like our own. We can explain the relevance of both factors for luck by noting this ambiguity.

7. *Conclusions*

In this paper, I argued that degree of luck depends both on modal distance and on probability. I argued that this requires a hybrid account of luck, an account with both modal and probabilistic features. I presented such an account, explained why it should be preferred to competing accounts in the literature and briefly considered possible objections. I do not claim to have provided a full defence of a complete account of luck. But the findings of this paper do indicate that hybrid accounts such as the one suggested in this paper are preferable to existing purely modal or probabilistic accounts of luck.[27]

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NOTES

[1] For some example in ethics, see Levy (2011) and Williams and Nagel (1976). For some examples in epistemology, see de Grefte (2018), Goldberg (2015) and Pritchard (2005).

[2] To say that these accounts are prominent is not to say they are uncontested. For critiques of the modal account, see Goldberg (2015), Hiller and Neta (2006), and Lackey (2008). For critiques of the probabilistic account, see Broncano-Berrocal (2015) and Pritchard (2005).

[3] In addition to the accounts mentioned, it is common to distinguish a separate lack-of-control account of luck (e.g. Broncano-Berrocal, 2015; Hales, 2016). Among authors defending this latter account, some take lack of control to be necessary for luck (Broncano-Berrocal, 2015; Coffman, 2007; Levy, 2011), with others sufficient as well (Greco, 2010; Riggs, 2007, 2009). If control is understood in a pre-theoretical sense, the sufficiency claim is dubious: there are many events, like the motion of the tides or some collision in a distant galaxy, that are beyond my control but nevertheless not cases of luck for me. The necessity claim is more plausible: paradigm lucky events like winning the lottery of finding treasure are beyond my control. But as Pritchard has argued, understood in this way, it is not clear that we need a separate lack of control condition on luck, because plausibly control requires the absence of easy possibility of failure, so that every event that the modal account classifies as lucky will automatically satisfy the lack of control condition (Pritchard, 2005, p. 130). In any case, I will set the lack of control account aside in this paper. The point I am arguing is that a satisfactory treatment of luck requires a combination of features of the modal and probabilistic accounts. I do not claim the conditions developed in this paper are sufficient for luck.

[4] In fact, I believe that there are other determinants of luck beside probability and modal distance, but I will not argue for this claim here (cf. de Grefte, 2018).

[5] Pritchard draws on a standard possible world framework (Lewis, 1973, 1986).

[6] The notion of similarity is somewhat unclear. Lewis and Pritchard both take this notion to be primitive. Here, I will largely follow their example and rely on our intuitive understanding of degrees of similarity. See, however, Section 7.

[7] Cf. Coffman (2007), Levy (2011), and Pritchard (2005).

[8] The fact that far-out worlds may be relevant for luck has also been noted by Church (2013) and Carter and Peterson (2017). Some authors seem to suppose only nearby worlds are relevant for luck (Levy, 2011). We will go into this issue in Section 7.

[9] It should be noted that it is somewhat problematic to speak of 'the' probability of an event. This problem, known as the 'reference class problem', will be set aside in this paper. On the most plausible interpretations of the relevant reference classes, it will be the case that the probability that Jaimy will win is lower than the probability that Jerome will win.

[10] While it holds generally that events with low probability tend to fail to occur in worlds much like our own, this is not always the case. For illustrations, see the discussion below.

[11] Of course, this does not mean that our probabilistic judgements have to be correct. I claim that our judgments of what is easily possible correlate with our judgements of probability, not with any actual probabilities involved.

[12] Note that Rescher's account thus includes a significance condition besides a probabilistic condition.

[13] In the rest of the paper, I will set aside the influence of significance on luck. As I said before, the points made here are compatible with such additional conditions on luck, and my arguments do not depend on their inclusion.

[14] The examples can be modified to make the difference more pronounced. We can, for example, keep on adding safeguards to Joe's case. As long as these safeguards do not *entail* him keeping his job, there will be a probability that he loses it. We can then increase the lottery size in Jill's case to an arbitrarily large number, such that her probability of losing her job matches Joe's. Then it seems even more clear that Jill is luckier to have kept her job than Joe is to keep his.

[15] For a supporting overview on the empirical literature on luck, see Pritchard and Smith (2004). This interpretation is not beyond criticism (Hales & Johnson, 2014) who attribute the relevant intuitions to framing effects. A full discussion of their arguments would take us too far afield. The argument in this paper strictly depend on the cases presented so need not go into too much detail about the empirical support for the modal aspect of luck. In any case, it is interesting that there are some indications that what holds for these cases holds for ordinary luck ascriptions generally.

[16] For example, as more of Joe's safeguards hold up, the probability of him getting fired slowly decreases. On the other hand, Jill's probability stays the same until after the 'lottery'. Then it changes radically to (almost) 1 or (almost) 0.

[17] Again, I want to stress the account presented in this section is not meant to be complete. There may be other conditions on luck, such as significance, that give rise to different differences in degree of luck. In this paper, I focus on the role of probability and modal distance.

[18] Complete dissimilarity seems problematic, for any two worlds are similar to some extent, for example, to the extent that they are both worlds. Complete similarity of two worlds is also problematic, because two worlds, even if they share all other properties, would at least be numerically dissimilar.

[19] How to measure this degree of similarity? That is a difficult question, and there is considerable controversy regarding its answer. In this paper, I will assume it has an answer, but I will remain uncommitted as regards the specific form the answer may take or whether it will be a precise answer (see also below). In any case, it seems we have a relatively firm intuitive grasp on the notion of similarity, at least firm enough to make the points I want to make in this paper.

[20] Note that this measure of luck does not feature a factor for the significance of the event, contrary to, for example, Rescher's account (where this significance was denoted by the symbol Δ).

[21] The claim that necessary events are never lucky has been criticized by Stephen Hales (2016). See below for discussion.

[22] In fact, this is the standard analysis from authors endorsing purely modal accounts of luck (Pritchard, 2005).

[23] I present an additional objection to Lackey's counterexample in de Grefte (2018). For Lackey's argument depends on the invalid inference from the lucky combination of a set of preconditions for an event to the luckiness of the event itself. If it is a matter of luck that I escape being hit by a car one day, the luckiness of that event does not seem to entail that all other events of my life, which all depend on this event, are now also cases of luck.

[24] Even considered directed at pure probabilistic or modal accounts of luck, Hales' cases are at least ambiguous. One of his cases concerns, for example, a logic grad student who putatively has bad luck in picking out a necessarily unprovable thesis topic. Read *de re*, the event is a necessity, for she picked as her topic the completeness of mathematics. Read in this way, Hales' claim amounts to the claim that it is a case of bad luck that the completeness of mathematics is unprovable. But, although this is sad, it is not a case of *luck*. Read *de dicto*, however, Hales' claim amount to the claim that it is a matter of luck that the grad student picked an unprovable topic at all. This is a genuine case of luck, but it can also straightforwardly be accommodated by even a purely modal or probabilistic account of luck because it is not necessary that the grad student picked the topic she did.

[25] Carter and Peterson do not go into this issue, although the framing of their account in terms of modal weighted *likelihoods* seems to suggest that they have something like probabilities in mind here.

[26] I thank an anonymous referee for pressing me on this point.

[27] I would like to thank Catarina Dutilh Novaes, Jeanne Peijnenburg, Adam J. Carter, and Duncan Pritchard, as well as the audience of the Edinburgh Graduate Conference 2017 and an anonymous reviewer for this journal for helpful comments on earlier versions of this paper.

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